PIXEL SKETCH
AND
GRAPHICS EDITOR

Copyright by S D Lemke

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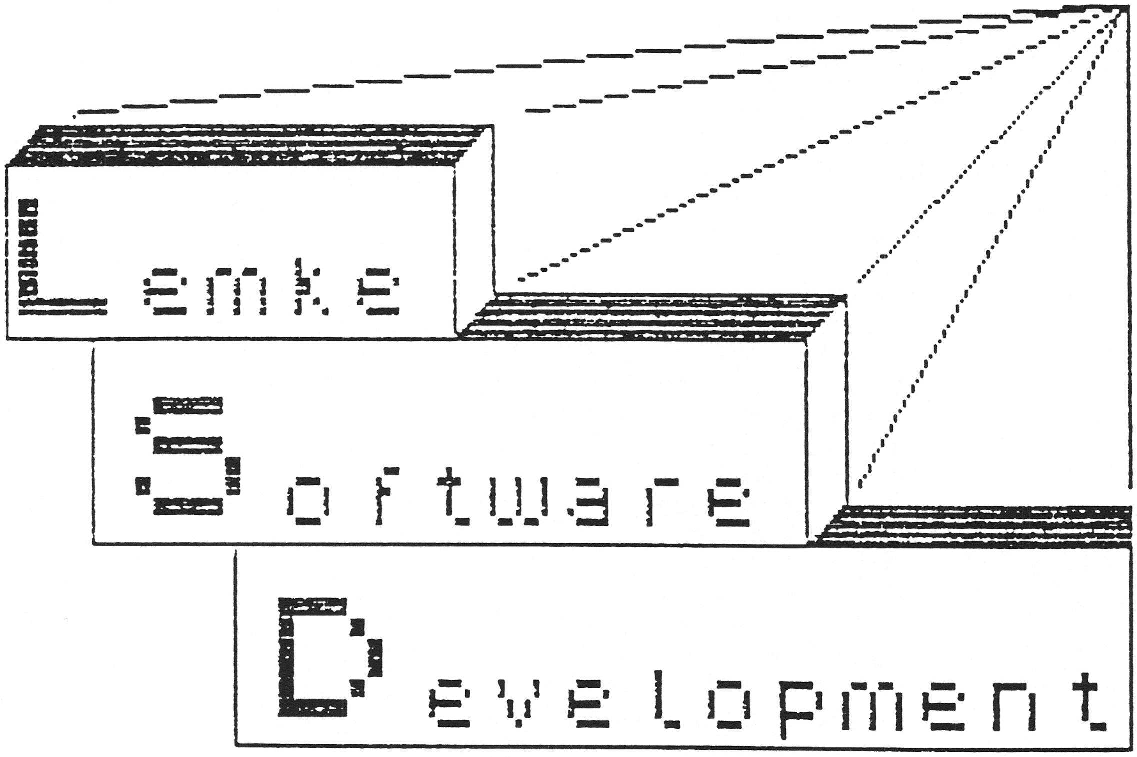

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1.0 INTRODUCTION

The Pixel Sketch/Graphics Editor by Lemke Software Developement is a graphics design program that works with the Standard video mode, the Extended Color video mode, and (in a limited fashion) the High Resolution video mode of the TS 2068 Color Computer.

PS/GE 2068 uses Joystick commands and simple key commands to draw and edit your graphic designs. Each pixel on the 256x176 pixel screen (512x176 in the high resolution video mode) can be used. Simple key commands are used to change ink colors, flash or bright attributes, or paper color. Use the joystick to move the plot curser around the screen. The "fire" button turns the curser draw function on and off. Made a mistake? No problem. The erase function reverses the curser to erase instead of draw so errors are easily removed. PS/GE 2068 commands can draw lines, arcs, and circles too. You can also add text! Your X and Y coordinates are displayed at all times for easy reference.

PS/GE 2068 also does for graphics what a good text editor does for word processing. You can duplicate part of a screen, erase all or part of a screen, scale up or down, rotate (2 dimensional flat rotation) by 90 degrees, paint, and shade. You can make mirror images, invert (reverse the ink and paper pixels), and more! You can merge designs from 1 screen into another (relocating its position at the same time). You can digitize a screen segment to create user defined graphics characters. You control the size and shape of each screen segment operated on. Machine language is extensive so the response time is fast. Each function is followed up with a YES/NO save question that will restore your previous screen just in case an (OOPS!) error gets commanded.

TS 2068

PS/GE 2068

(c) S D Lemke

Loading

1.1 INITIALIZATION

Load "PS/GE 2068" or Load "".

PS/GE 2068 will load in about 5 minutes. It will auto-run and alert you to "STOP TAPE". Please do so. (If the High Resolution video mode is used, additional machine code must be loaded from the tape).

As you begin, you will be asked to select a background paper color. Press a number key (0 to 7). The resulting color is displayed above the key, for example 1 is blue and 7 is white. This color can be changed (locally) as described below.

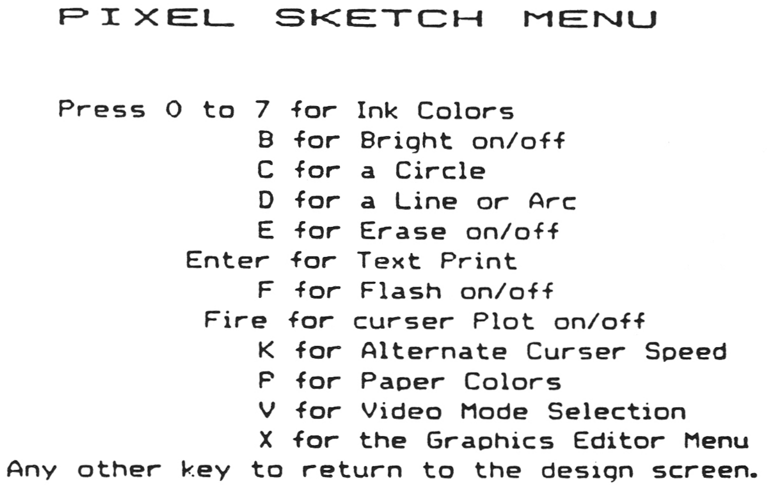
After the paper color is selected, you will be asked to select the desired video mode. Press "0" for the Standard video mode, press "1" for the Extended Color video mode, and press "2" for the High Resolution video mode. The bulk of the user guide is directed toward the Standard and Extended Color video modes. The High Resolution video mode is limited to the curser draw/erase functions, the paper color selection, erase (clear screen), hard copy print (2040 printer), text print, load, and save functions. See appendix "C" of the "2068 Personal Color Computer User Manual" for a brief description of these video modes and their various characteristics. Also, see sections 2.11 and 4.4 for more discussion of video mode use and selection. If you use the high resolution video mode, you will be prompted to "START TAPE". Please do so. The "high resolution" machine code routines follow the basic program and machine code on the tape.

PS/GE 2068 has at your disposal 2 descriptive menus for quick and easy reference: the Pixel Sketch (PS) menu lists all of the functions used to develope your graphics design (Press "M" for the PS Menu); the Graphics Editor (GE) menu lists all the functions used to edit your design (Press "X" for the GE Menu).

2.0 PIXEL SKETCH MENU

The Pixel Sketch (PS) menu can be listed on the screen by pressing "M". (Warning: be sure that you do not have the GE menu on the screen before you press "M". If you press "M" with the Graphics Editor menu on the screen PS/GE 2068 will interpret this as a "Merge" command.) To activate any of the PS functions, press the key associated with that option. A status indicator will flash briefly at the bottom/center of the screen to verify your command. If a function requires additional data it will prompt you for it. For example: the CIRCLE command will prompt you for the desired radius length. PS/GE 2068 will draw a circle with the specified radius at the present curser location. See section 2.3 for more details about the circle function.

The following is a copy of the PS Menu.



```
              PIXEL  SKETCH  MENU

     Press 0 to 7 for Ink Colors
                B for Bright on/off
                C for a Circle
                D for a Line or Arc
                E for Erase on/off
            Enter for Text Print
                F for Flash on/off
             Fire for curser Plot on/off
                K for Alternate Curser Speed
                P for Paper Colors
                V for Video Mode Selection
                X for the Graphics Editor Menu
  Any other key to return to the design screen.
```

2.1 INK COLORS

Press a number 0 to 7. Ink - "number" will flash briefly and the color associated with that number will be used until the next INK command is given. This new ink color will be poked into the screen attribute file everywhere the curser goes. Thus, everywhere that you move the curser, the colors will change to those of the curser, paper and ink, bright and flash. This is true if plot (see section 2.8) is on or off.

2.2 BRIGHT

Press "B". If BRIGHT is off, it will toggle to on. If it is on, it will turn off. The appropiate message will flash briefly and the Bright attribute will be modified wherever the curser goes.

2.3 CIRCLE

Press "C". You will be prompted to type in the desired CIRCLE radius (in pixels). Type an integer number and press "Enter". If the desired circle goes off screen, you will be given a warning and new data will be requested. (The circle will be drawn around the current curser position.)

Note: the CIRCLE command and DRAW LINE/ARC command below use the standard commands accessed through Basic. Thus the ink pixel colors will only be used in the standard video mode. The extended color video mode will probably have a color contrasting with the paper color. Also, if these functions are called from the high resolution video mode, only the primary display file will be effected resulting in a dashed line, arc, or circle. Similarly, since these commands only effect the primary display file, they will appear to show on the screen at an "X" location of twice your curser postion. But this is only because they are using an "X" value in the 32 column mode instead of 64!

2.4 DRAW LINE or ARC

Press "D". The Draw function can draw either LINES or ARCS depending on the user commands. You will be prompted for an "X" distance (in pixels). Type in an integer number and press "Enter". Positive is to the right, negative is to the left. Next, you will be prompted for a "Y" distance. Type in an integer number and press "Enter". Positive is up, negative is down. If the X and Y distances are valid (remain on the screen), then you will be prompted for an arc command. Type in a real or integer number. Zero is a straight line from the curser position to the point defined by the X and Y distance values. A positive number provides an arc with a counter-clockwise inflection. A negative number produces an arc with a clockwise inflection. The greater the magnitude of the number the more curviture to the arc.

Note: large arc commands may go off the screen. If this happens, PS/GE 2068 will attempt to catch this error and provide an error warning. See section 4.5. Press "Enter" to continue. PS/GE 2068 will attempt to restore the design to the condition just prior to the last draw command. Then try a new command. The high resolution video mode does not support this error trapping and will simply stop will an error report.

2.5 ERASE

Press "E". If ERASE is on, it will toggle off. If off, it will turn on. The appropiate message will flash briefly. When on, Erase reverses the normal function of the curser. Every ink pixel that the curser touches is turned to a paper pixel. Note: Erase must be turned off in order to draw even if the curser plot function is turned on!

2.6 TEXT/PRINT

To activate the TEXT PRINT function, Press "ENTER". PS/GE 2068 will print text in the standard 32 (or 64) print columns as defined by the curser location. The top of the letter is defined by the "Y" location of the curser. (This may not be a standard row location!) Type in the text. Upper and lower case letters, numbers, punctuation, and most of the special characters accessed with the symbol shift key can be printed. To exit the Text/Print mode, press "Enter" again. Text corrections must be made by re-typing over the old text. Note: as each character is typed, the "X" coordinate is updated. When a line is completed, a new line will automatically start. When the last line is completed, the curser will move to the top of the page and continue.

2.7 FLASH

Press "F". If FLASH is off, it will toggle to on. If it is on, it will turn off. The appropiate message will flash briefly and the flash attribute will be modified everywhere that the curser goes.

2.8 DRAW/PLOT

The DRAW/PLOT funtion is used to draw on the screen with the joystick. To activate the PLOT function, Press "FIRE" (the Fire button on your joystick). If Plot is off, it will toggle to on. If plot is on, it will turn off. The appropiate message will flash briefly. While on, the curser will turn each paper pixel it touches to ink (providing Erase is turned off). If Plot is off and Erase is off, moving the curser across the screen does not affect the pixel directly, however, the attributes held by the curser are continually poked into the screen attribute file. Thus the Plot off, Erase off curser mode can be used to edit the attribute files (ink color, paper color, bright, flash) data.

2.9 CURSER SPEED

Press "K". If Curser is off, it will toggle to on. If it is on, it will turn off. The appropiate message will flash. This is an alternate curser speed moving 4 pixels at a time instead of the normal 1 pixel. Use this to speed up positioning the curser. Pressing "Fire" to plot automatically returns to the standard curser speed. (However, with plot on and activating the alternate curser speed, a dashed line can be drawn with every forth pixel turned to ink color.)

2.10 PAPER COLOR

To change the PAPER COLOR, Press "P". You will be prompted for a color (number). Press a number key (0 to 7). The corresponding color is indicated on the keyboard above each key. A color verification message will flash briefly. This paper color attribute will be used everywhere that the curser goes. (In the high resolution, 64 column, mode the entire page will change paper color. The 2068 hardware will automatically select a contrasting ink color for you. The ink, bright, and flash attributes are not supported in the 64 column mode.)

2.11 VIDEO MODE SELECTION

To change VIDEO MODES, press "V". You will be prompted to select video mode 0 (standard 32 column mode), or 1 (extended color mode). These two modes are operated on concurrently and can be switched back and forth at any time. The high resolution (64 column) video mode must be selected at program initialization and must be maintained through out the job since it is not compatible with the other video modes.

2.12 GRAPHICS EDITOR MENU

To list the Graphics Editor (GE) menu, and to access its various functions, press "X".

The following is a copy of the GE menu.

GRAPHICS EDITOR MENU

```
Press C to Copy (duplicate) a screen segment
      D to Digitize a screen segment
      E to Erase a screen segment
      H to Hard Copy (Print) the screen file
      I to Invert a screen segment
      L to Load a new screen
      M to Merge 2 screens
      P to Paint a figure
      R to Rotate a screen segment
      S to Save a screen segment
      W to scale (half size) a screen segment
      Y to make a Mirror Image of a screen segment
      Z to scale (double size) a screen segment
Any other key to return to the design screen.
```

3.0 GRAPHICS EDITOR MENU

The GRAPHICS EDITOR menu (GE) can be listed and the GE functions accessed by pressing "X". With the GE menu displayed, press the key assigned to the desired function, or any other key not assigned to a function (like ENTER) to return to the design screen. Note, you must press "X" to display the GE menu before you can access any GE functions!

Most of the GE functions operate on a user defined "Window" or screen segment. This window is drawn (overlayed) upon the design screen and can be moved anywhere on the screen through simple joystick commands. The size of the window can be changed with the following keys:

Press	L	to make the window Larger
	S	to make the window Smaller
	5	to make the window narrower
	6	to make the window shorter
	7	to make the window taller
	8	to make the window wider

When the window is properly sized and positioned, press the "FIRE" button on your joystick to execute the function. When the function is complete, you will be prompted with SAVE? Press "Y" or "N". See section 4.3.

Whenever a GE function is used that requires a window, the screen attribute file (colors, flash, or bright data) is lost. This is because there was not enough memory available to store it. This may be over come in the future with high speed data storage devices like a floppy disk. For now, it is advisable to leave the painting and coloring until the last so you do not loose your colors.

3.1 COPY

With the GE menu displayed, press "C". The COPY function is used to duplicate or copy the contents of the "window" to a new location. "COPY FROM" will flash briefly at the bottom/center of the screen, then a window will appear in the center of the screen. Adjust the size, shape, and location of the window as desired. Press "FIRE" on your joystick. "COPY TO" will flash briefly. Use the joystick commands to move the window to the desired copy location and press "FIRE". PS/GE 2068 will scan the "FROM" window and create a new copy in the "TO" window.

3.2 DIGITIZE

With the GE menu displayed, press "D". The DIGITIZE function is used to "digitize" the picture segment in the user defined window. The digitize function displays the decimal and binary equivalence of the screen display file. This data can be used (outside PS/GE 2068) to define user defined graphics characters. The data is identified by its row and column numbers relative to the upper-left corner of the user defined window. Digitize will analize an 8x8 pixel element. Then you will be prompted to press "C" to make a printer "copy" of the screen. Any other key will continue with the next element until the entire window has been digitized.

3.3 ERASE

With the GE menu displayed, press "E". The ERASE function is used to erase a screen segment. Everything inside the window will be erased. In the high resolution video mode (64 column mode), this fuction is used to erase the entire page.

3.4 FILL/SHADE

With the GE menu displayed, press "F". The FILL/SHADE function is used to fill or shade a closed figure. This function does not use a window. To use FILL/SHADE, use the following procedure:
1) position the curser in the desired closed figure
2) select the desired ink and paper colors
3) Press "X", then press "F" to execute FILL/SHADE

You will be prompted for a FILL/SHADE pattern. This is an 8 number patter consisting of ones or zeros. Each "1" represents an ink dot, each "0" represents a paper dot. A total of 256 shading patterns are available. Note: "00000000" would result in changing only the paper color in a window segment. "11111111" would be the same as painting, see section 3.9.

4) Type your 8 number FILL/SHADE pattern, press "ENTER"

Note: see section 4.2 Important Notes and Operating Hints - Paint/Shade.

3.5 HARD COPY

With the GE menu displayed, press "H". The HARD COPY funtion will send a screen copy to the 2040 type printer. In the high resolution mode, the 2040 printer produces a rotated picture of 64 lines and 24 columns. If you implement the full size printer modification, then HARD COPY (and the digitize screen copy) functions call the printer interface code located in RAM at 23296. See section 7.0.

3.6 INVERSE

With the GE menu displayed, press "I". The INVERSE function changes every paper pixel inside the user defined window to paper, and every paper pixel is changed to ink. The effect is the same as looking at a photographic negative.

3.7 LOAD

With the GE menu displayed, press "L". The LOAD function reads (loads) screen data into memory. Be sure that the tape is properly positioned since PS/GE 2068 does not differenciate between screen files and will read the first file it finds. See section 4.1 Important Notes and Operating Hints - Loading and Saving Screen Data.

3.8 MERGE

With the GE menu displayed, press "M". The MERGE function is used to combine (merge) 2 designs into 1. With 1 design already in memory (Load 1 if necessary), after pressing "M", you will be prompted to "START TAPE". PS/GE 2068 will load (see section 3.7). You will then be prompted for the merge procedure: merge screen 1 (old) into screen 2 (new), screen 2 (new) into screen 1 (old), etc. Press the key associated with the desired option.

Next, you will follow a "COPY" type function locating the screen segment to be copied from the one screen into the other, see section 3.1. Note, MERGE destroyes all the colors and other attributes of both screens being merged.

3.9 PAINT

With the GE menu displayed, press "P". The PAINT function is used to paint/color closed figures. Postion the curser inside the desired figure. Select the desired colors for paper and ink (also select other flash or bright attributes), and execute the paint function. This procedure is identical to steps 1-3 of the FILL/SHADE function. See section 3.4.

3.10 ROTATE

With the GE menu displayed, press "R". The ROTATE function is used to rotate a screen segment (window) 90 degrees clockwise. This is a flat (2 dimensional) rotation. Note that by definition, the window for this function must be square. The largest window segment that can be rotated is 168x168 pixels.

3.11 SAVE

With the GE menu displayed, press "S". The SAVE function "saves" the screen file to tape. Position the tape, as prompted type in the screen/file name and press "ENTER". The standard video mode will save 1 screen file. The extended color mode and the high resolution video mode both save 2 files (note: a key must be pressed between the saves to start the save of the seconfd file). See section 4.1 Important Notes and Operating Hints - Loading and Saving Screen Data.

3.12 WIDE

With the GE-menu displayed, press "W". The WIDE view function scales the window segment to one half its original size. A double window is displayed for this function. The contents of the large window will be scaled down to fit the smaller window.

3.13 MIRROR

With the GE menu displayed, press "Y". The MIRROR image function creates a right hand mirror image of the window segment. A double window is displayed for this function. The contents of the left hand side of the window will be reflected to the right hand side of the window.

3.14 ZOOM

With the GE menu displayed, press "Z". The ZOOM function scales the window segment to twice its original size. A double window is used for this function. The contents of the smaller window are scaled to fit the larger window.

4.0 IMPORTANT NOTES AND OPERATING HINTS

4.1 LOADING AND SAVING SCREEN DATA

When LOADING and SAVING screen data with the PS/GE 2068, it is very important to note which video mode you are in. (If you are not sure, use the VIDEO MODE SElECT function to select what you need). The stardard video mode will load and save 1 screen file while the other video modes save and load 2 files. If you are not in the right mode, you may end up needing a second display file that does not exist, or need to load a second but be unable to. YOU MUST BE SURE TO LOAD FILES IN THE SAME MODE THAT THEY WERE SAVED. When in the high resolution video mode (64 column mode), PS/GE 2068 temporarily switches into the 32 column mode for loading and saving data. This temporarily distorts your picture, but allows you to see the usual load/save lines on the screen. The high resolution mode will be restored once the load/save is completed.

4.2 PAINT OR SHADE

When PAINTING or SHADING complex figures, it may be necessary to use more than 1 paint/shade command to fill the figure. Both of these functions operate on the screen file in every direction FROM the curser position TO the first ink pixel encountered in a given pixel row. The painted figure must be closed (have a continuous line defining its shape - like a circle) or paint/shade will escape from the figure and fill the screen. Paint and shade will not re-paint or re-shade a figure since these will be full of ink pixels. Hint: try to place the curser in the center of complex figures.

4.3 YES/NO (oops!)

Perhaps the best time and effort saving feature for such a program is an oops! feature. PS/GE 2068 has one. After each function is completed, you will be prompted with Save? Press "Y" if you want to keep the present screen. Press "N" if you want to restore the old screen. If you made an error and initiated a function you did not want, or made some other mistake, let the function go to completion, then use the "oops" function to restore the old screen for you. Note: even though the design screen is restored, the color file for the extended color mode is gone. The color file of the standard video mode however is restored. Also, one very important note, after each GE function, the curser always goes to coordinates X=0 and Y=0 (the left hand corner of the page!)

4.4 COLOR RESOLUTION

The TS 2068 color computer color resolution is at most 1 ink color and 1 paper color per 8x8 pixel element in the standard video mode. Each row has 32 8x8 elements, and there are 22 8x8 rows that you can draw on. In the Extended Color video mode, each 1x8 pixel element can have 1 paper color and 1 ink color. Each row has 32 1x8 elements, but now there are 176 pixel rows (each can each have a different set of colors). In the high resolution mode, the entire screen page is fixed to have 1 paper and 1 ink color, but now each row has 64 8x8 pixel elements, and there are 22 8x8 element rows available to draw on.

4.5 ERROR TRAPPING

The PS/GE 2068 program has error trapping in it. If an error occurs, an error warning is displayed and the program pauses while you are prompted to press "ENTER" to continue. PS/GE 2068 will attempt to restore the design screen to the condition it was in prior to the last command. Error trapping in not supported in the high resolution video mode.

If you need to stop program execution and restart later, try:

```
GOSUB 320: GOTO 30
```

5.0 DEFINITION OF PROGRAM VARIABLES

PS/GE 2068 uses "Basic" to control the program logic, poke values into the machine code variables, and call various machine code routines to perform the Graphics Editor functions. This is a brief description of the program variables that interface the basic and machine code halves of the PS/GE 2068 program.

VARIABLE NAME	MEMORY LOCATION	DESCRIPTION
Y	57999	Curser location (vertical)
X	57998	Curser location (horizontal)
LAST	57997	Last curser value
LOC	57996/5	Curser screen location (256*Peek 57995 + peek 57996)
FIRE	57994	-1 if Fire is pressed 0 if fire is not pressed
ATR	57993	Curser attribute value
SAVE	57992	current curser value
ERASE	57991	-2 if Plot is on 1 if Erase and Plot are off 0 if Erase is on
X1	57990	Left side of window
Y1	57989	Top of window
TEXT	57989	Code of Text character
mode	57988	Video Mode Flag
Y2	57987	Bottom of window
Joystx	57986	-1 for window 0 for curser
X2	57985	Right side of window
not used	57984	
not used	57983	
not used	57982	
X3	57981	Hi Res. (X - 256*Peek 57981 + X)
SPD	57980	Curser Speed Value
DIGVAL	57979	Digitize decimal value
Bytes	57978-1	Digitize Binary bytes
Shade	57978-1	Shade 8 bit pattern

Note: these variable names are for use/definition only and may not be the same as used in the PS/GE BASIC.

6.0 DEFINITION OF MACHINE CODE ROUTINES

The following is a brief description of the machine code used in the PS/GE 2068 program.

MACHINE ROUTINE	ENTRY ADDRESS	DESCRIPTION
R1	56000	Copy attribute file 1 to file 2
R2	56014	Initialize display file 2 (EC mode)
R3	56031	Copy attribute file 2 to file 1
R4	56045	Copy display file 2 to file 1
R5	56057	Copy display file 1 to 49800 (file 3)
R6	56069	Copy file 3 to display file 1
R7	56081	Copy display file 1 to file 2
R8	56093	Copy display file 2 to file 3
R9	58043	Rotate Function
R10	58535	Plot Function
R11	60682	Print Text Function
R12	61103	Zoom Function
R13	61685	Wide Function
R14	62316	Erase Function
R15	62502	Copy Function
R16	49386	Paint/Shade Functions
R17	56243	Mirror Image Function
R18	57133	Digitize Function
R19	57652	Inverse Function
	56105	Set up alternate video mode code

High resolution video mode codes.

R10	58535	Plot Function
R11	61585	Print Text Function
	56150	Hard Copy (2040 printer) Utility

7.0 Full Size Printer Modification

The following modifications are the minimum required to route printed output from the PS/GE 2068 to a full size printer. Since you supply your own interface software, this modification should allow any printer/interface to run (assuming that the memory locations are compatible.)

Since I am only familiar with the TASMAN interface, I will only address this software, although others should be similar. The screen/graphics copy (or high resolution screen copy) code as the TASMAN documentation calls it, executes from memory reserved for the 2040 print buffer starting at 23296 and extending to 23552. For ease of code loading, we will place the interface code higher in RAM and have it relocated prior to execution. The PS/GE 2068 has free memory above location 62760 and below the relocated system code (around 63256 I beleive). This is where the print driver code will be placed. Other print driver codes may be placed here and executed from this location if they are not too long (where they will be over-written by system code).

The following 8 short steps should get you on the way to printing your PS/GE 2068 output on full size printers.

Step 1: Load the PS/GE 2068 program.

```
LOAD "PS/GE 2068"
```

When the "STOP TAPE" alert is displayed, break the program using the Cap Shift + Break keys.

Step 2: Modify the "BASIC" program.

Type the following lines. (Do not edit existing lines.)

```
  25 RANDOMIZE USR VAL "63020": CLS : GOSUB VAL "100" : ON ERR
GOTO VAL "9300"

  939 IF c$ - "H" OR c$ - "h" THEN GOSUB VAL "9500" : GOTO VAL
"30"

  DELETE LINE 950

  1560 PAUSE VAL "0" : LET b$ - INKEY$ : IF b$ - "C" OR b$ - "c"
THEN GOSUB VAL "9500" : CLS

  9500 RANDOMIZE USR VAL "23296" : RETURN

  9999 SAVE "PS/GE 2068" LINE 0 : SAVE "PS/GE 2068" CODE
48500,14535
```

Step 3: Load the Interface Code.

Load the particular printer interface code you will use into memory starting at 62760. For my Star Gemini 10, I will use the tas-starg code.

```
            LOAD "tas-starg" CODE 62760   [press ENTER]
```

Step 4: Poke in the interface relocation code.

Poke the following numbers into the assigned locations. This code is executed by: RANDOMIZE USR 63020.

```
     POKE 63020,17       POKE 63021,0        POKE 63022,91
     POKE 63023,33       POKE 63024,40       POKE 63025,245
     POKE 63026,1        POKE 63027,0        POKE 63028,1
     POKE 63029,237      POKE 63030,176      POKE 63031,201
```

Step 5: Save the new "BASIC" and Code.

Save your updated PS/GE 2068 program on a new tape.

```
      TYPE:  GOTO 9999   [press ENTER]
```

Steps 6, 7, and 8 update the print driver code for the true 64 column (high resolution mode graphics). This modification will work only for those printers that use the TASMAN code for EPSON, STAR, and SHINWA type printers. Other print drivers might be modified in a similar fashion. Two POKEs are used to call a short machine code subroutine outside the print driver code. This code is located at 62545. The 62545 code controls the "pointer" that locates data in display file 1 or 2 used in this advanced video mode. It may be possible to redirect your particular interface code to this same routine.

Step 6: Load the 64 Column Mode Machine Code.

```
    TYPE:  LOAD "hi res" CODE  [press ENTER]
```

Step 7: Poke in the Hi Res Print Driver Code.

```
      POKE 62819,81      62820,244   (re-directs print driver)
      POKE 62911,196 (use display file 2 for alternate columns)

      POKE 62545,205     62546,75     62547,91      62548,229
      POKE 62549,213     62550,213    62551,225     62552,17
      POKE 62553,0       62554,32     62555,25      62556,235
      POKE 62557,225     62558,225    62559,205     62560,75
      POKE 62561,91      62562,229    62563,213     62564,225
      POKE 62565,17      62566,0      62567,32      62568,237
      POKE 62569,82      62570,235    62571,225     62572,201
```

Note: your print driver code must be "POKED" to produce the large size page. (POKE 63015,0)

Step 8: Save your Hi Res Code.

```
TYPE:  SAVE "hi res" CODE 56150,6885 [press ENTER]
```

Now you are ready to use the PS/GE 2068 with a full-size printer.

ADVANCED PRINT DRIVER MODIFICATION:

It is possible to use lines 9500-9700 of "BASIC" to select page size, location, etc. I have included a section of code I use with my Star Gemini 10 as an example of what can be done. With this code I can select 11 sizes of printout and 3 page locations (left, center, or right justified). Note, however, there is very little memory available for "BASIC" modification with the program as is. To open more memory for your new code, go through the existing BASIC and change every integer constant to a string constant as shown below.

```
old:     PRINT AT 10,0;" etc. ....."
new:     PRINT AT VAL "10", VAL "0";" etc. ....."
```

This will slow BASIC execution slightly, but will allow for more BASIC to be used in your print driver modification. If you do not allow enough room, as the program runs, the variables in RAM will eventually expand and over-write some of the PS/GE 2060 machine code, which if used will "lock up" your system.

It is not practical (or possible) for me to explain in detail just what must be done to adopt every interface to this program. But, what I can try to do is to explain a little of this program to ease your job of expanding your printer interface software to a more "useful" form. My printer, a STAR GEMINI 10 has several different graphics modes that determine the dot density, and thus the page size. The TASMAN code also has the option of 2 sizes. My BASIC code allows me to choose from 11 sizes of output. There are really 12 possible (6 printer x 2 software), but the largest size does not fit on an 8 inch wide sheet of paper. I can also select where on the page to place this output. This is done by inserting blank columns before printing the graphics data. Now, all this is already done by the TASMAN interface code, I simply found out where and how it was done and modified it by pokes from BASIC to change forms as I required. My particular TASMAN code had 3 data tables imbedded in the code. I simply needed to poke data into the tables to change the print mode, leading blanks, and number of points plotted per line. (Actually it was a little more difficult than that since the standard graphics mode and all the TASMAN tables were set up for 4 data points. When I went to the alternate graphics modes, I needed to change all the tables to hold and read 5 points. This meant moving these to new locations and re-directing the "loads" that read the tables.)

Once this is accomplished, all you need to do is to set up the data in BASIC to match the desired graphic commands. In the sample program, I POKE 4 numbers into the interface code for each size of output. This data is a table (lines 9650 to 9659). Column 1 represents the printer graphics command. Column 2 is the number of points to be plotted devided by 256 (1 - 256 points plotted, 2 - 512). Column 3 defines a double size (0) or single size (1) page. In the double size mode, each pixel on the screen creates a 2x2 dot on paper. Note, the data from columns 2 and 3 are tied together. A single size page will have 256 data points, a double size page will have 512 data points. Column 4 defines the number of blank spaces required to place this size output in the center of the page.

Just a couple more pointers. I call 2 subroutines from BASIC. LINE 300 saves the screen file in upper RAM and allow you to print a menu on the screen. LINE 320 restores your design. Both of these routines take care of any video mode changes that might be required. Lines 9800 to 9850 are used to choose between the 2040 printer and a full size printer. This can be called by adding a new line: 9995 GOSUB VAL "9800" .

I hope that this helps you in your effort to put your full size printer interface into the PS/GE 2068 program. If you have any questions, send me a letter explaining your problem (along with a self addressed/stamped envelope) and I will try to help... if I can.

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```
9500 REM Hard Copy Printout
9510 IF pt= VAL "1" THEN  GO TO  VAL "9530"
9515 IF mode <=  VAL "2" THEN  COPY : RETURN
9520 RANDOMIZE  USR  VAL "56150": RETURN
9530 GO SUB  VAL "300": GO SUB  VAL "9600": GO SUB  VAL "320": RANDOMIZE  USR
AL "23296": RETURN
9600 REM Define output width
9610 CLS : PRINT  AT  VAL "5", VAL "0";"Indicate your desired page size.";'';'
ress -- 0 for 7.1 x 4.1"; TAB  VAL "10";"1 for 6.4 x 4.1"; TAB  VAL "10";"2 fo
5.7 x 4.1"; TAB  VAL "10";"3 for 4.3 x 4.1"; TAB  VAL "10";"4 for 2.1 x 4.1";
B  VAL "6";"ENTER for 4.1 x 2.1"; TAB  VAL "10";"5 for 3.6 x 2.1"; TAB  VAL "
;"6 for 3.2 x 2.1"; TAB  VAL "10";"7 for 2.9 x 2.1"; TAB  VAL "10";"8 for 2.2
2.1"; TAB  VAL "6";"or  9 for 1.1 x 2.1"
9620 PAUSE  VAL "0": LET p$= INKEY$ : IF mode >=  VAL "2" AND (p$<"0" OR p$>"
 THEN  GO TO  VAL "9620"
9630 POKE  VAL "23491", VAL "0": POKE  VAL "23493", VAL "1": POKE  VAL "23548"
VAL "1": LET lc= VAL "18": IF p$ >= "0" AND p$ <= "9" THEN  RESTORE ( VAL "96
+ VAL p$): READ p$: POKE  VAL "23491", VAL p$: READ p$: POKE  VAL "23493", VA
$: READ p$: POKE  VAL "23548", VAL p$: READ p$: LET lc= VAL p$: GO TO  VAL "9
"

9650 DATA "5","2","0","4"
9651 DATA "4","2","0","8"
9652 DATA "6","2","0","11"
9653 DATA "1","2","0","18"
9654 DATA "3","2","0","29"
9655 DATA "5","1","1","22"
9656 DATA "4","1","1","24"
9657 DATA "6","1","1","25"
9658 DATA "1","1","1","29"
9659 DATA "3","1","1","34"
9690 REM Define Margine
9700 CLS : PRINT  AT  VAL "10", VAL "0";"  Indicate page margine.";'';"  Pres
- 1 for left justified"; TAB  VAL "11";"2 for page centered"; TAB  VAL "1[illegible]"
or right justified"
9730 PAUSE  VAL "0": LET p$= INKEY$ : IF p$<"1" OR p$>"3" THEN  GO TO  VAL "9
"

9740 IF p$="1" THEN  POKE  VAL "23526", VAL "1": RETURN
9750 IF p$="3" THEN  LET lc=lc* VAL "2"
9760 LET LC=LC+ VAL "1"
9770 POKE  VAL "23526",lc: RETURN
9800 REM Define Printer
9810 CLS : PRINT  AT  VAL "10", VAL "0";"   Indicate Printer type.";';" Press
-  1 for Full Size"; TAB  VAL "12";"2 for TS 2040 type"
9830 PAUSE  VAL "0": LET p$= INKEY$ : IF p$<"1" OR p$>"2" THEN  GO TO  VAL "9
"

9840 LET pt= VAL p$: IF p$="1" THEN  RANDOMIZE  USR  VAL "63020"
9850 RETURN
```